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E. J. BUTLER

The Imperial Forestry Institute University of Oxford

NINTH ANNUAL REPORT

1932—33

AND

PROSPECTUS

Oxford
THE HOLYWELL PRESS, LTD.
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IMPERIAL FORESTRY INSTITUTE.

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UNIVERSITY OF OXFORD.

NINTH ANNUAL REPORT OF THE IMPERIAL FORESTRY INSTITUTE FOR THE YEAR 1932 - 33.

PERIOD OF REPORT.

The annual reports of the Institute have hitherto been prepared for the academic year, beginning October. In consequence of a recent decision of the University regarding the period to be covered by departmental reports, those of the Institute will in future be prepared for the University financial year, 1st August — 31st July. The present report, therefore, covers an interim period of ten months only, October, 1932 — July, 1933.

STAFF.

2. The following was the constitution of the staff during the year :—

DIRECTOR.

Professor R. S. TROUP, C.I.E., M.A., D.Sc. (Oxon.), F.R.S.

LECTURERS AND DEMONSTRATORS.

Silviculture: THE DIRECTOR; R. BOURNE, M.A. (Oxon.); J. MACDONALD,*† B.Sc. (Edin.).

Forest Economics and Policy: THE DIRECTOR; R. BOURNE, M.A.

Forest Management: R. BOURNE, M.A.

Pathology (Mycology): W. R. DAY, B.Sc., M.A. (Oxon.); T. R. PEACE, B.A. (Cantab.).

Structure and Properties of Wood: L. CHALK, M.A., D.Phil. (Oxon.); Miss M. M. CHATTAWAY, B.Sc., M.A. (Oxon.); C. L. STOCKER, B.A. (Oxon.).

Forest Zoology: R. N. CHRYSTAL, D.Sc. (Edin.), Hon. M.A. (Oxon.); J. M. B. BROWN, B.Sc. (Belfast).

Forest Botany: J. BURTT DAVY, M.A. (Oxon.), Ph.D. (Cantab.); A. C. HOYLE, B.Sc., M.A. (Oxon.).

Surveying: M. O'C. TANDY,* D.S.O., O.B.E., M.A. (Oxon.).

Forest Engineering and Utilization: A. H. LLOYD, M.C., M.A. (Oxon.).

Acting Secretary: Miss K. ALLISON-BROWN, B.A. (Oxon.).

Librarian: Miss G. GUINEY.

* Part-time Lecturers.

† Forestry Commission Research Officer attached to the Institute.

3. The unsatisfactory financial situation continued to hamper the work of the Institute. The lectureships in Physiology and Soil Science continued in abeyance. The post of lecturer in Forest Economics remained unfilled, and instruction was given by Mr. Bourne, though research had to be suspended. The services of the special lecturer in Forest Law had to be dispensed with, and the Director undertook such work as was necessary in that subject; he also dealt with Forest Policy, including the advisory work which that subject entailed. The financial stringency further necessitated the abolition of the post of Secretary, and Mr. P. S. Spokes vacated his appointment at the beginning of the year: Miss K. Allison-Brown, Assistant Secretary, acted as Secretary throughout the year. These economies are particularly unfortunate at a time when the advisory work of the Institute in all parts of the Empire is increasing at a rapid rate, not only in volume but also in range; they have imposed a severe burden on those members of the staff who have been called on to undertake the extra work and responsibility involved.

4. The number of students attending courses of study for the whole year or for shorter periods was ten. These may be classified as follows:—

				Total 1932-33.	Average of previous 5 years.
POST-GRADUATE PROBATIONERS.					
Colonies:	Nigeria ...	1			
	Gold Coast ...	1			
Others:		—		2	12
FOREST OFFICERS ON LEAVE.					
Colonies:	Nyasaland ...		1		
India:	Punjab ...	2			
	United Prov. .	1			
		—	3		
Dominions:	Australia ...	2			
	Canada ...	1			
		—	3		
			—	7	17
PRIVATE STUDENTS				1	2
				—	—
	Totals ...			10	31
				—	—

5. The great reduction in the number of students, as compared with the average of the previous five years, may be regarded as temporary, and is due entirely to the financial situation, which has resulted in greatly diminished recruitment for the forest services and a reduction in the number of officers deputed for courses of instruction.

INSTRUCTION AND RESEARCH.

6. *Silviculture and Forest Management.* Throughout the year the Colonial Service probationers worked with Mr. Bourne on the silvicultural and management problems of stock-taking, concentrating latterly upon an analysis of the vegetation surveys carried out in various colonies. A sample land utilization survey was undertaken in the neighbourhood of Oxford and, with other students of the Institute, a series of excursions was made to study the regional differences in the usage of land and, in particular, the ecological and historical relationships of the oak and beech in Southern England. In the Hilary Term an officer on leave from Nyasaland underwent a special course of study in the Soil Research Laboratory with the idea of carrying out soil surveys on his return to duty. In the Easter Vacation the School of Forestry working plan tour in the Chilterns was attended by officers on leave. A regional and soil survey of the working plan area was made and vegetation and forest type maps were prepared. The occurrence in the area of fossil soils, relics of a previous climate, was recognised. Sample enumerations were also undertaken with the object of illustrating the actual stocking and, as far as possible, the normal stocking in irregular woods according to type. In the Trinity Term the probationers attended the Director's course of lectures on tropical silviculture and one probationer and four officers on leave attended Mr. Bourne's lectures on silvicultural systems. All students at the Institute also followed a course of lectures on current problems of forestry given by Mr. Bourne and individually discussed with him questions of silviculture and management relevant to the work in hand in their several territories. In particular, consideration was given to the principles on which the local vegetation in each case should be classified into types and, in illustration of the procedures to be followed in the collection of the necessary data, the first week of the summer continental tour was devoted to the collection of further data as to the indicator values of trees, shrubs, herbs, grasses, lichens and mosses in the central zone of the French Jura. These data were supplemented during subsequent visits to various forests to study their history and treatment. Sufficient data of a comparable nature were collected in the Swiss Jura and plateau forests and in the Black Forest to demonstrate the need for a regional classification of forest types. Time was also devoted to a study of the general possibilities associated with irregular stocking and of the technique in the silvicultural treatment and organisation of irregular mixed forests. Following this tour two officers on leave remained abroad to carry out a detailed study of these subjects in a selected area with a view to writing theses for the

Diploma in Forestry. In addition to the above tour, two officers on leave visited selected forests in Normandy with the Director, and one probationer spent a fortnight studying the research methods employed at the Swiss Federal Research Station at Zürich. The Institute is much indebted to the many forest officers in France, Germany and Switzerland who contributed so much to the instructional value of these tours.

7. As indicated in the previous paragraph, Mr. Bourne arranged in the course of his instructional duties to continue his researches on regional survey procedure and, with the help of students, added materially during the year to the data required to classify the woodland areas in Southern England and the fir forests in the Jura into forest types on scientific principles. With the new land utilization survey maps of Great Britain as a foundation, he has also commenced a survey extending from the Chiltern Hills to the New Forest. The general object is to demonstrate the value of extensive surveys of a regional nature, but the immediate aim is to complete the study of the oak and beech woods of these regions. Arrangements have also been made, in the case of selected areas covered by the survey, to co-operate with Aerofilms, Ltd., in testing the value of vertical air photographs produced by the infra-red process. Hitherto there have been technical obstacles to the employment of the process in vertical photography from the air, but the degree to which haze is penetrated and colour values enhanced has been clearly demonstrated by oblique photography, and much is to be expected from the application of the method to vertical photography.

8. Mr. J. Macdonald, the Forestry Commission's Research Officer in charge of research in England and Wales, is stationed at the Institute, an arrangement which is of mutual benefit to the Institute and the Commission. The work carried out by him includes an extensive series of statistical sample plot measurements and experiments in afforestation and nursery work, the nursery investigations being undertaken mainly in Kennington Nursery, Oxford. Students of the Institute have the opportunity of studying the statistical and experimental methods employed. Details of the work in question appear in the Annual Reports of the Forestry Commission.

9. During the year under review numerous enquiries have been received relating to questions of silviculture and management. While many of these have been answerable without resort to field work, others have involved inspection of woodlands and the preparation of reports. In one instance an estate of over 2,000 acres was inspected and reported upon and in another,

with the assistance of a past student of the School of Forestry, detailed stock maps were prepared for 1,000 acres and a working plan was drawn up.

10. *Systematic Forest Botany*. Dr. Burtt Davy continued in charge of this section. Three students attended regular courses of instruction, two of whom were probationers, one for Nigeria and the other for the Gold Coast, and one was a forest officer on leave from Nyasaland. An officer on leave from Nigeria spent a few days at the Institute working over material collected by him.

11. The total number of botanical identifications completed during the year was 4,674, an increase of 41 per cent. over last year. Of the determinations made, 2,687 referred to Africa, including the Gold Coast, Kenya, Nigeria, Northern Rhodesia, Nyasaland, Sierra Leone, South Africa, Southern Rhodesia, Tanganyika Territory, Uganda, and Zanzibar with Pemba. Specimens identified for the Forest Products Research Laboratory numbered 483. Those identified for other correspondents, and for officers of other Sections of the Institute in connection with their work, numbered 1,498; this figure includes a large number of poplars and willows. In the course of this work fourteen new species of trees and shrubs from tropical Africa have been brought to light. These have been described, and have been published or accepted for publication, in the *Kew Bulletin*; they comprise *Afzelia caudata* Hoyle (Nigeria), *Berlinia confusa* Hoyle (Nigeria), *Bonamia vignei* Hoyle (Gold Coast), *Canthium martinii* Dunkley (N. Rhodesia), *Crossandra spinescens* Dunkley (N. Rhodesia), *Dombeya praetermissa* Dunkley (N. Rhodesia), *Fagara trijuga* Dunkley (N. Rhodesia), *Hippocratea hirtiuscula* Dunkley (N. Rhodesia and Tanganyika Territory), *Homalium rhodesicum* Dunkley (N. Rhodesia), *Millettia kennedyi* Hoyle (S. Nigeria), *Pachylobus densior* Hoyle (Gold Coast), *Pachylobus paniculata* Hoyle (Gold Coast), *Salacia owabiensis* Hoyle (Gold Coast), *Triumfetta palmatiloba* Dunkley (N. Rhodesia). Other research, carried out under the supervision of Dr. Burtt Davy, has included an investigation of the physiographical factors of Nyasaland in their effect on the forest vegetation, by Mr. P. Topham, Assistant Conservator of Forests, Nyasaland, who was awarded the B.Sc. Degree on a thesis prepared as a result of this work. Mr. Topham has also brought up to date the list of Nyasaland vernacular names of trees, which will be incorporated in the second edition of the Nyasaland check list.

12. There has been some delay in the issue of No. II of 'Forest Trees and Timbers of the British Empire,' dealing with twenty West African species, but this number is now in the

press and will appear shortly. Meanwhile work has been commenced on No. III, dealing with several West Indian trees and timbers.

13. One branch of work which is of great importance throughout our Colonial Empire is the preparation of local forest floras or descriptive catalogues of trees, shrubs, and other plants of importance in forestry. This is an essential preliminary to a survey of the forest resources of any country, and in many of our Colonies the lack of such floras or catalogues has hitherto greatly hampered the work of carrying out these surveys. Although in certain cases general floras exist, these contain numerous families, genera and species of no importance to forestry, and omit much information which is required by the forest officer. These floras, again, besides being expensive, are too bulky for daily use in the field. 'The Flora of Tropical Africa,' for example, already runs to eleven and Trimen's 'Handbook of the Flora of Ceylon' to six fair-sized volumes. The great advantage of small pocked-sized forest floras applying to restricted regions has been amply demonstrated in India, and it is very desirable that similar floras should be prepared for all our Colonial territories, and even for specific regions in the larger territories. With this object in view, a start was made by the Imperial Forestry Institute in 1927-28 with the compilation of check lists as a preliminary to the preparation of descriptive catalogues. At first these lists consisted of card catalogues based on the specimens sent by the Colonial Forest Departments for identification; they are now almost complete, and are being typewritten. The intention is to send them out to the Colonies concerned to serve as a means of collecting further botanical information, and where necessary material, together with data on native names, habitat, local uses, etc., which will be embodied subsequently in a printed catalogue. The typewritten check lists may have to pass through two or more editions before they are sufficiently accurate and complete to form the basis for a printed catalogue. Check lists have already been prepared for Nigeria, Nyasaland, Northern Rhodesia, Sierra Leone, the Solomon Islands, and Cyprus (with which have been included Malta, Gibraltar, Palestine, and Aden). Further lists are under preparation for the Gold Coast, Uganda, Kenya (revision of Battiscombe's List), Tanganyika, Ceylon, and Trinidad. In the preparation of these check lists valuable assistance has been received from the various forest departments and from individual forest officers attending the Institute.

14. Attention continues to be given to the cricket-bat willow problem, a satisfactory solution of which will depend on co-ordinated research in different directions. In order to secure co-ordination, a conference of persons interested in bat-willow pro-

duction was summoned by the Forestry Commission and was attended on behalf of the Institute by Dr. Burtt Davy, Mr. Day and Dr. Chrystal. It was decided to collect data for a publication on the subject, and with this object an extended tour at the cost of the Forestry Commission was made by Dr. Burtt Davy and Mr. Day through the willow-growing districts during the flowering period. A preliminary report has been prepared, and the material collected is being worked over for a further report. Growers and buyers of bat-willows complain of the high percentage of trees which give unsatisfactory wood, and of the waste found in otherwise good trees. The main causes of this appear to be (1) the planting of male trees and of wrong species and varieties of female trees, (2) improper or careless treatment of nursery sets, (3) neglect of young trees after planting, (4) the effect of unsuitable soils and unfavourable situations, (5) planting the trees too closely, (6) injury from 'watermark' disease, 'stain,' and 'speck': the last-named has been attributed to an insect, but requires further investigation. It is commonly stated that there is no male *Salix alba* var. *caerulea*, and male willows are rejected by buyers when known to be such. On this tour Dr. Burtt Davy found male trees of this variety, indistinguishable from female *caerulea* growing alongside them, both in habit of growth and in bark, and has reached the conclusion that *Salix caerulea* is no more than a form of *Salix alba*, a view which has been confirmed independently by Dr. Floderus, of Stockholm, as the result of a study of the type of *S. caerulea* and of British material submitted to him.

15. Although bat-willow trees are being extensively planted, there does not appear to be any danger of the over-production of first-class willow timber within a reasonable period of time. So much of the wrong sort of willow is being planted, so much of it on wrong soils, and so few growers are producing good sets or are taking proper care of their trees, that poor quality bat timber promises to continue a drug on the market for a long time to come, while really first-class timber will continue to command a good price unless unforeseen circumstances intervene. Cuttings are being grown from trees which have been felled and are undergoing tests at the Forest Products Research Laboratory, Princes Risborough. From these it will be possible to grow pedigree stocks of trees, of which the character and qualities of the clefts are known and have been tested.

16. Some interesting results have been obtained in the raising of willows from seed. It is well known that species of willow hybridize freely if they belong to the same taxonomic group, and it is probable that several forms now being grown are the result of crosses between *S. alba* and *S. fragilis*, both

of which are frequently found growing together. The actual parentage of these hybrids, however, is unknown, and it is of importance that it should be ascertained. In the spring of 1931, Dr. Burtt Davy collected fruiting material of cricket-bat willows from different parts of the country, and seed was sent to Mr. H. P. Hutchinson at the Agricultural Research Station, Long Ashton, Bristol, who successfully raised a number of seedlings; it is expected that these will furnish useful evidence as to their parentage. An interesting result of this experiment is the phenomenal vigour shown by the seedlings. By October, 1932, seedlings from seed sown in June, 1931, varied in height from 6 in. to 3 ft. 6 in., and during the growing season of 1933 some of them attained a height of over 10 ft. Many have developed stout stems, up to 13·3 centimetres in girth at the base. Mr. Hutchinson reports that the amount of growth made in 1933, in spite of the abnormally dry season, is remarkable, and greatly exceeds that generally made by cuttings in the same time. Rapid growth is an important point in the production of bat timber, and the result obtained suggests the possibility of securing strains of bat-willow capable of more rapid growth than has been obtained hitherto.

17. The critical study of the cultivated poplars begun last year resulted in the collection of some eight hundred poplar specimens. Mr. G. S. Cansdale was employed as part-time Research Assistant to work over this material. The work has now been completed and a report has been drawn up. A working key to the cultivated poplars has been prepared by Dr. Burtt Davy and Mr. Cansdale, together with illustrations of leaf-type in the more critical of the important species. Emerging from this investigation is the fact that some poplars, particularly those of the hybrid black-poplar group, produce two types of leaf, those of long vigorous shoots being more characteristic than those of short shoots, which are frequently of a different form. It is of great importance, therefore, that specimens for identification should include mature leaves from both long and short shoots.

18. The number of specimens received during the year was 5,671, which is 6,680 less than in 1931-32, a year in which an abnormally large number was received for the teaching herbarium: owing to lack of space, it has been found necessary to curtail the amount of material obtained for teaching purposes. The number of specimens received for the reference herbarium shows a gratifying increase in interest on the part of forest officers in the Colonies, several of whom are anxious to complete inventories of the trees and shrubs of their forests. A list of the principal accessions is given in Appendix II. The total number of named and mounted sheets in the herbarium at the

end of the year was 42,553, an increase of 6,189 over the total of last year. The naming of the trees in the University Park is nearly completed, and 276 additional trees were labelled.

19. The Institute is again much indebted to the Director and staff of the Royal Botanic Gardens, Kew, and to the Keeper of Botany and staff of the British Museum (Natural History) for facilities for consulting the collections under their charge, and for the loan of authentic material for study. Acknowledgments are also due to Professor Dr. W. Robyns, Director of the *Jardin Botanique de l'État,* Brussels, for the loan of type specimens, and to Messrs. Albert Wilson, F.L.S., and H. N. Dixon, F.L.S., for assistance in the determination of British and Colonial mosses.

20. *Structure and Properties of Wood.* This section continued under the charge of Dr. L. Chalk. Two probationers, one for Nigeria and the other for the Gold Coast, attended courses of instruction.

21. Dr. Chalk completed his research on multiperforate plates in vessels and made further progress with his study of anomalous woods. A hitherto undescribed type of ray cell, functioning as a vessel element, was discovered and found to occur in a wide range of genera. This feature was described in a joint paper by Dr. Chalk and Miss Chattaway in the Proceedings of the Royal Society. Miss Chattaway continued her study of the rays of the Sterculiaceae, certain characteristic features being traced to different modes of development in the ray initials. Mr. Stocker has been making a macroscopic study of the Leguminosae, preparing both generic descriptions and a lens key to genera, as far as this is possible. A scheme has been developed for checking the age and history of nursery stock by photomicrographs, and this has been used to a small extent by purchasers where the correct description of the consignment was in dispute. The method has proved very satisfactory, as it supplies incontrovertible proof of the age of the stock and a useful indication of its treatment.

22. In June, 1932, it was proposed to carry out research work on the systematic anatomy of dicotyledonous plants, with special reference to timber-producing types; it was intended that this work should form a liaison between the researches being undertaken in systematic botany on the one hand and wood anatomy on the other, with the object of providing data as to the anatomical organisation of floral and vegetative structures which should be of value in compiling a natural system of classification of species. It was proposed to add, wherever

possible, evidence concerning the past and present distribution of the types under consideration. The work on wood-structure and distribution of correlated types is being undertaken by Dr. Helen Bancroft and that on floral and vegetative anatomy by Miss J. Dickson. As a result of the kind co-operation of various officers, namely Messrs. B. D. Burtt, J. B. Clements, C. E. Duff, E. J. Kelly Edwards and A. A. Pardy in tropical Africa, and Messrs. H. E. Desch and C. F. Symington in the Federated Malay States, and of the authorities of Kew, the British Museum and the Swedish Geological Survey, an abundant supply of material has been forthcoming, and three papers by Dr. Bancroft have been published since October, 1932 (see under Publications, Appendix I). A note on certain fossil plants from East Africa will appear in the *Annals of Botany* for October, 1933, and an account of fossil dicotyledonous woods from Mount Elgon, East Africa, has been accepted for publication in the *American Journal of Botany*. In June, 1933, Miss Dickson obtained the B.Sc. degree on a thesis entitled 'The Floral Anatomy of the Papaveroideae,' which has been accepted for publication in the Journal of the Linnean Society. Since April 1st, 1933, the continuance of these researches has been made possible by a grant to Dr. Bancroft from the Christopher Welch Fund, and an intensive study of the Monotoideae, an African sub-family of the Dipterocarpaceae, has been undertaken. The results of this study are to be published in a series of papers by Dr. Bancroft and Miss Dickson separately, and the first of the series, 'The taxonomic History and geographical Distribution of the Monotoideae,' by Dr. Bancroft has already been accepted for publication in the *American Journal of Botany*. A grant from the British Association will make it possible to purchase the instruments necessary for the anatomical work on this group. In July, 1933, Dr. Bancroft carried out an investigation of the elm species on the north coast of the Cotentin Peninsula, France, with a view to comparing these with the elms of the south coast of England. It is hoped to publish the results in due course.

23. Among the specimens received for identification there have again been several of archaeological interest from Egypt and Palestine. Among the most interesting of these were some fragments of a 3rd Dynasty coffin (B.C. 2980) from Saqqara, received from Mr. A. Lucas and provisionally identified as cypress. This coffin is remarkable for its construction, the parts being built up of a number of thin laminated sheets of wood in the manner of plywood. Further fragments from the tomb of Tutankhamun included, besides cedar, elm from a wheel and the body of a chariot, *Zizyphus* sp. from a walking stick, and tamarisk from the foot of the pall support. Material from Palestine included pine, olive, ash, and acacia.

24. Over 1,200 woods have been added to the collection, which is the largest number yet received in any one year. Not only is the number very satisfactory, but the fact that the proportion of specimens definitely correlated with herbarium material also continues to rise is especially gratifying. The work of sectioning the woods in the collection and of cataloguing their anatomical features has been continued and is proving of great value for research and for purposes of identification. The wood collection now includes a total of 8,602 hand specimens, of which 5,036 are represented in the collection of microscope slides. The number of named species represented is 3,897. The total number of slides, including teaching sets and duplicate collections, is over 20,000. The demand for microscope slides and photomicrographs of timbers continues to increase, and over 400 slides and 200 photomicrographs were distributed. A list of hand specimens received during the year is given in Appendix II. Among other wood specimens received, special mention should be made of a section from the base of an unusually large sapele mahogany tree (*Entandrophragma cylindricum*) from Nigeria, received from the Director of Forests through Mr. J. D. Kennedy.

25. *Pathology* (*Mycology*). Mr. W. R. Day continued in charge of this Section, with Mr. T. R. Peace as assistant in charge of research work on behalf of the Forestry Commission. There were no students under instruction during the year.

26. Research work covered a wide range of problems, the most important of which related to (1) frost damage, (2) infection experiments with *Dasyscypha calycina* and *Phomopsis pseudotsugae*, (3) the Dutch elm disease, (4) the ink disease of sweet chestnut and beech, (5) control of the leaf-cast disease of larch, (6) poplar canker, (7) damping-off of seedlings, (8) disease of the cricket-bat willow, (9) needle-cast of pine, (10) leaf-rust disease of birch, (11) fungi causing butt-rot of conifers. The investigation of the heart-rot of oak, which has been in progress for some time, is now in abeyance for a period of four years, during which a thorough examination will be made of the data collected from sample plots.

27. As a result of the research into frost damage which has been in progress for some years past, a paper has been prepared on the first part of this work dealing with the critical temperatures for injury by frost and the anatomy of frost-injured trees: this will be published as a Memoir during the year 1933-34. Research on this subject has been continued and attention has been concentrated on the effect on frost damage of varying conditions other than temperature during freezing. Particular regard has been paid to variations in the humidity and the rate of movement of the air, and to the rate of onset of frost and the

manner of thawing. It is not yet possible to report on the year's work as the examination of material and data is still in progress. It may, however, be necessary to make further experiments on these lines next year.

28. Infection experiments with *Dasyscypha calycina* and *Phomopsis pseudotsugae* have failed to produce any satisfactory result, and it may be necessary, when time is available, to make further and more extensive inoculations with them. So far, the results of the work have been almost entirely negative, and this may perhaps be taken to be evidence in favour of the conclusions drawn from the work on frost damage, that these fungi are at the most secondary parasites, and often are not to be regarded even as such.

29. The fifth of the Forestry Commission's annual surveys of the Dutch elm disease showed that there was a slight diminution in the incidence of the disease; the factors responsible for this are unknown. Further surveys of the disease are desirable if only to discover the factors controlling its spread and possibly also affecting the susceptibility of the host. During the year Mr. Peace published a paper summarizing the results of the survey up to the present time. Acknowledgments are due to Mr. E. H. Savill, Deputy Surveyor, Windsor Great Park, for his kind assistance in the investigation of this disease.

30. A further outbreak of ink disease on the sweet chestnut (*Phytophthora cambivora* Petri) has been discovered in Herefordshire. Trees over a considerable area of woodland are affected, and the disease has been in progress for some years. Inoculation experiments were continued, the most successful being on *Castanea crenata*, the Japanese chestnut, which is supposed to be highly resistant. Further inoculations will be necessary to test the powers of resistance of this species. A tour of the woodlands known to be infected was made in the autumn of 1932, and showed that the disease is still progressing. A further tour of inspection will be made in the autumn of 1933. In connection with the investigation of the ink disease in its relation to beech, acknowledgments for facilities given are due to Sir George Cooper of Hursley Park and to Mr. Ashton, the Agent for that estate.

31. Work on the leaf-cast disease of larch (*Meria laricis*) is now confined to large-scale spraying experiments in various Forestry Commission nurseries. The spraying is proving successful in controlling the disease, but owing to the vagaries of the weather, upon which this disease largely depends, it takes time to collect sufficient data to show what strength of spray and what manner of spraying are most efficient. A Memoir on this disease, published after the close of the year, embodies the

results of the work carried out by Mr. Peace, together with that done by Mr. Holmes for a Diploma in Forestry. In the meantime a leaflet (No. 21) has been published by the Forestry Commission embodying the results of these investigations and large-scale nursery trials in different parts of the country.

32. Work on the development of the poplar canker disease is developing slowly. The number of species of poplar that can be seriously affected by this disease is proving larger than at first seemed probable. Among others, *Populus generosa* is found to be consistently subject to canker of a serious type, and the susceptibility of *P. eugenii* has been still further demonstrated. With regard to *P. eugenii,* data are being collected as to the mode of development of cankers, and interesting results are already being obtained. There seems to be no prospect, however, that this will be a simple problem to solve. The thanks of the Institute for assistance in connection with this investigation, and for specimens received, are due to Colonel E. R. Pratt of Ryston Hall, Norfolk, and to C. A. Benn, Esq., of Moor Court, Lyonshall, Herefordshire.

33. In connection with the damping-off of seedlings some progress has been made in sorting out the fungicides that might be of use in controlling this disease. Special attention is being given to those which have not hitherto been much used for this purpose. So far no fungicide has proved to be absolutely reliable, but it is hoped that new ones may be more effective. The results of the year's work are not yet available.

34. As mentioned in paragraph 14, Mr. Day accompanied Dr. Burtt Davy on a tour in connection with the cricket-bat willow problem, and collaborated in the preparation of a preliminary report. The 'watermark' disease is still causing much damage in parts of Essex, and the Essex County Council has promulgated an order for the compulsory felling of diseased willows. The removal of affected branches has been tried by a few growers, but how far it will prove successful in permanently checking the spread of the disease has yet to be demonstrated. 'Stain' is a serious cause of loss, but until the origin is known suitable methods of treatment cannot be prescribed. Research on this problem is desirable.

35. The needle cast of Scots and other pines is a disease that has come to the front during the year. Owing to the extensive planting by the Forestry Commission during the last ten years, pine seed from various sources has been employed, and exotic species have been the subject of experiment. The results have not always been uniformly successful, and one of the troubles attending this work is that certain races of Scots pine and certain species of exotic pines are subject to the discoloura-

tion and eventual casting of the needles. An investigation of this matter is proposed and certain preliminary observations are being made. So far the evidence suggests that the complaint is of a complicated nature, a number of factors acting together to cause it.

36. During recent years the leaf-rust of birch (*Melampsoridium betulinum*) has been the cause of considerable loss of birch seedlings owing to early and severe defoliation by this fungus. An attempt has been made to ascertain the source and mode of infection in the birch seed-beds. This is proving to be a more difficult matter than might have been expected in a rust the life cycle of which was supposed to be fully known. The observations on this fungus will be continued.

37. One of the potential causes of loss in conifer plantations is butt-rot, that is, heart-rot entering through decayed roots. It has been felt for some time past that this is a problem requiring serious attention. Steps are now being taken to determine what are the species of fungus attacking conifers in this way, and arrangements have been made for the supply of material from rotted trees, from which cultures will be made. At the same time data will be collected as to the soil conditions in the places from which the samples are sent.

38. The advisory work of this Section continues to increase, the number of enquiries dealt with during the ten months covered by the present report being 77, as compared with 56 for the twelve months covered by the previous year's report. These enquiries present a great variety of problems, and some require a considerable amount of time for their investigation. The only reports of importance communicated to the Forestry Commission during the year were the annual report on the Dutch elm disease, by T. R. Peace, and a preliminary report on the cultivation of the cricket-bat willow, by J. Burtt Davy and W. R. Day.

39. *Forest Zoology.* Dr. R. N. Chrystal continued in charge of this Section, with Mr. J. M. B. Brown as Assistant Entomologist engaged on research work for the Forestry Commission. No special instruction was given to students of the Institute during the year.

40. Research work was carried out mainly on behalf of the Forestry Commission. A comprehensive survey has been made in East Anglia of the distribution of the moth *Evetria buoliana* Schiff., and the incidence of its attack in Scots pine plantations of different ages. Practically all parts of the East Anglia area have now been visited, and a good deal of information has been collected which throws light upon the variation of the intensity

of the attack in different areas. Further experiments have been made in disbudding, and at Rendlesham the results of a divisional experiment in disbudding, which has been carried out by the Forestry Commission officers, were critically analysed, as the method differed in some essentials from that which had been practised elsewhere. The result of this analysis showed that the disbudding method still requires to provide more striking results before it can be advocated as a general method of control on a large scale. Other experiments along the same lines have been laid down at Wangford Warren, and the results obtained will be assessed at the end of the present season. It is then hoped to include the whole of these results in a general publication on the pine shoot moth.

41. This year has been signalized by a marked increase in the attacks of the oak tortrix moth (*Tortrix viridana* L.) in many parts of the Forest of Dean. This was in accordance with the conditions in other parts of the south of England, where the oak has been severely attacked. As has been the case in former years, however, the High Meadow Woods in the Dean Forest were markedly free from attack. Some preliminary experiments were carried out with the object of ascertaining in what degree the coincidence or otherwise of the bursting buds and the hatching eggs determined the present distribution of the moth. The first results tend to show that this factor is largely responsible for the fluctuations in the numbers of the caterpillars from year to year. The results obtained this year will be supplemented by a further series of experiments during another season. Preliminary enquiries have been made by Messrs. Craven of Evesham regarding the possibility of carrying out trials of motor dusting machines in certain of the infected areas next season. Two other moths, the winter moth (*Cheimatobia brumata* L.) and the mottled umber moth (*Hybernia defoliaria* L.), have been generally associated in the past with the tortrix in the Dean Forest area. The former, which appeared in such numbers a few years ago, has of late years been practically negligible, and there was no indication during the year of a recurrent attack. The mottled umber moth, however, has kept pace with the tortrix, and this year several areas of considerable extent were severely attacked by it. Its contribution to the current year's defoliation was considerable, but in the Nag's Head enclosure, where it was very abundant last year, the attack seems to be already on the decline. Observations have led to the belief that this decline may be due in part to the activity of a small Braconid parasite belonging to the genus *Apanteles*, the cocoons of which outnumber the pupae of the mottled umber moth. Three important parasites in all have been obtained from this species. Studies have also been made on the parasites of the oak tortrix moth, bred from several

localities on a considerable scale, but there was no indication that the parasite had anywhere got the upper hand, as the general percentage of parasites reared ranged from 10 to 30 per cent. of the number of larvae collected. It is hoped that it will be possible to continue the work on these moths for some time longer, as observations up to the present have shown that only after a considerable period has elapsed will it be possible to collect sufficient evidence to throw light upon the origin, spread and ultimate cessation of outbreaks.

42. An arrangement has been made whereby the Forestry Commission and the Parasite Laboratory of the Imperial Bureau of Entomology, Farnham Royal, have undertaken to make a study of the pine shoot beetle (*Myelophilus piniperda* L.) and other species prevalent in the Scots pine plantations in this country. This work falls into two divisions, (1) the study of the beetle in relation to the growth of Scots pine, and (2) the study of the control of the beetles with special reference to the part played by the parasites and predators. The Imperial Institute of Entomology has undertaken that section of the work which deals with the study of the parasites and predators, while the Forestry Commission will concern itself with the biological and silvicultural aspects of the problem. While a start has already been made with the study of the parasites and predators, it has not yet been possible to begin a comprehensive study of the pine beetle itself. It is hoped that this work will be put in hand during the coming season.

43. The number of enquiries dealt with by this Section during the ten months under review was 35, as against 56 during the previous year. One of the most interesting of these was from Miss Gardiner of King's College, London, regarding an outbreak of the beech weevil (*Orchestes fagi* Gyll.) which appeared in considerable numbers in parts of the Chilterns; the prevalence of this insect is a direct result of the dying back of the beech trees growing on shallow soils over chalk. As a result of the drought conditions which have prevailed during 1933, similar outbreaks of *Orchestes* were reported from the New Forest, Hampshire. An interesting case was brought to notice by Mr. W. A. Cadman, of severe damage to larch and Douglas fir near Oxford by vast flocks of starlings resting in the tree-tops and causing distortion and defoliation. The areas in question were visited and a short illustrated account has been prepared, which it is hoped to publish in the near future.

44. *Forest Economics and Policy.* One probationer for the Gold Coast and one officer on leave from India attended courses of lectures in Forest Economics by Mr. Bourne and Forest Policy by the Director. Research in Forest Economics remained

in abeyance for financial reasons. The Director dealt with a number of enquiries on questions of Forest Policy and Administration.

45. *Forest Engineering and Utilization.* Mr. A. H. Lloyd continued in charge of this Section. Instruction in Forest Engineering was given to two probationary students, one for Nigeria and one for the Gold Coast. Practical training in the erection and use of spars, derricks, and other engineering appliances was given in connection with the R.E. Section, O.U.O.T.C., and a temporary timber bridge was constructed across the River Cherwell. Visits were paid to local engineering works, including building and road construction and the erection of a heavy bridge. Thanks are due to the Oxford City Engineer and to the Oxfordshire County Surveyor for kindly arranging special visits and demonstrations for the students. Acknowledgments are again due to the Director, Forest Products Research Laboratory, Princes Risborough, for the facilities given to students visiting the Laboratory.

46. *Surveying.* Instruction in Surveying was given by Colonel Tandy to one officer on leave from India.

LIBRARY AND INFORMATION BRANCH.

47. *Library.* During the year 160 books and 747 pamphlets and bulletins were added to the library. Current periodicals numbered 95, an increase of 3 over the number in the previous year. Books borrowed, exclusive of those consulted in the library, numbered 2,372. Acknowledgments for presentations of books and other material to the library are due to Mrs. Brooks, Dr. Burtt Davy, Mr. J. M. Cowan, Mr. A. Graham, Mr. W. S. Jones, Professor Troup, and the Siamese Legation in London. Reference was made in last year's report to the visit of the Librarian to Dublin to inspect the library of the late Dr. Augustine Henry. As a result of this visit, about 100 books and over 2,000 pamphlets were acquired: these have not yet been entered and catalogued, and are therefore not included in the figures at the beginning of this paragraph. This material, chosen with a view to filling gaps in the library collection, is of particular interest, being for the most part out of print, scarce, and of both scientific and historical value. The pamphlets are enriched by profuse notes by Dr. Henry and by letters to him from the authors. Grateful acknowledgments are due to Mrs. Henry for her kindness and co-operation in this transaction.

48. Information as to the library's resources was provided for the Union List of Periodicals in the University Libraries of Great Britain and Ireland, 520 slips being sent to London for entry in the general catalogue. This represents the number of

different series of bulletins, annual reports and periodicals regularly received in the library. A selection of Institute publications was sent to the Highland Agricultural Show at Dundee in June 1933, at the request of the Forestry Commission, Scotland, as part of their exhibit.

49. *Information Branch.* Special measures were taken during the year to bring the referencing of literature up to date. Mr. P. S. Spokes was engaged on this work throughout the year, and Mr. G. S. Cansdale was employed on a part-time basis in the referencing of German literature, which had fallen much into arrear. In all, some 20,000 references were added to the files of information. It is to be regretted that this work had to be suspended at the end of the year, for financial reasons; owing to its great importance, it is hoped that it may be possible to resume it in the near future. As Chairman of the International Committee on Forest Bibliography, the Director attended a meeting of the Committee held in Freiburg, Baden, in July 1933. The details of an international system of classification received final approval, and the classification scheme now awaits publication and circulation.

50. The reference files, which form an important adjunct to the library, have always been freely consulted by the staff and students. In recent years their value has become more widely appreciated, and increasing use is being made of them by persons representing other institutions, and by visitors working on their own account. The number of enquiries dealt with continues to increase, and constitutes a heavy item in the work of the Institute. Enquiries of a scientific and technical character relating to particular branches of work have been referred to under the various sectional headings. In addition there is a large class of enquiries of a more general kind, many relating to important administrative or statistical questions in various parts of the Empire and even in foreign countries. These enquiries involve much time and labour, and the present depleted staff of the Institute finds it increasingly difficult to cope with them.

51. The Director wishes to acknowledge the assistance received during the year from other libraries, particularly the Science Library, South Kensington, the Radcliffe (Science) Library, Oxford, and the libraries of the Royal Botanic Gardens, Kew, the Linnean Society, Rhodes House, the School of Rural Economy, and the Department of Botany in the University.

52. *Photographic Collections.* The work of entering and numbering photographic prints, negatives and lantern slides is making progress. So far 9,072 photographs, 815 negatives and 1,900 lantern slides have been entered in the collections. The

indexing of the lantern slides has been completed, but that of the photographs and negatives has still to be undertaken. Special acknowledgments are due to the Forest Department, Nigeria, for a set of photographs and negatives from that Colony, to Professor Sugiura for a set of photographs from Japan, and to Professor Watson, Oxford, for a large collection of lantern slides.

53. *Publications.* A list of publications issued during the year is given in Appendix I.

FINANCE.

54. The detailed accounts of the Institute will be published separately, after audit, in the *Oxford University Gazette.* The following is a summary of income and expenditure for the year :—

Income. Crown Agents, £4,339; Dominions and others, £650; Forestry Commission, £3,050; Department of Scientific and Industrial Research, £850; Interest on Capital Account, £529; Other Receipts, £160. Total Income, £9,578.

Expenditure. Staff Salaries and Pension Contributions, £6,306; Instructional Supplies, £404; Travelling, £261; Administrative, £2,481; Transfer to Information Branch, £500; Miscellaneous, £68. Total Expenditure, £10,020.

55. In order to obtain a correct idea of the year's working it should be noted that the balance brought forward at the beginning of the year amounted to £324. At the close of the year cash at bank amounted to £387, grants due to £243, and accounts receivable to £81, while on the other hand grants received in advance amounted to £793 and accounts payable to £37. This leaves a deficit of £119; this is mainly owing to the fact that payments due to the Information Branch for the last three years have been made during the past financial year.

R. S. TROUP, *Director,*
Imperial Forestry Institute.

OXFORD.
24th October, 1933.

APPENDIX I.

PUBLICATIONS.

The following publications have appeared during the year :—

BANCROFT, H. 'Some Fossil Dicotyledonous Woods from the Miocene (?) Beds of East Africa.' (Annals of Botany, Vol. 46, 1932).

'A Fossil Cyatheoid Stem from Mount Elgon, East Africa.' (New Phytologist, Vol. 31, 1932).

'A Contribution to the Geological History of the Dipterocarpaceae.' (Geologiska Föreningens I Stockholm Förhandlingar, Jan.-Feb. 1933).

BROOKS, R. L. 'Notes on the Trinidad and Tobago Species of Lauraceae.' (Kew Bulletin, 1933).

BURTT DAVY, J. 'The Occurrence of *Salix* in Temperate South America.' (Journal of Ecology, Vol. 21, No. 1, 1933).

'Note on *Sarcostemma viminale* in Tanganyika Territory.' (Proceedings of the Linnean Soc., 1932-33, Pt. II, p. 55, May 1933).

CHALK, L. 'Multiperforate Plates in Vessels, with Special Reference to the Bignoniaceae.' (Forestry, Vol. 7, No. 1, 1933).

CHALK, L., and CHATTAWAY, M. M. 'Perforated Ray Cells.' (Proceedings of the Royal Society, B. Vol. 91, 1933).

CHRYSTAL, R. N. 'A Destructive Woodboring Caterpillar in Poplar Trees.' (Country Life, Vol. 73, 1933).

DAY, W. R. 'Defoliation of Larch as a Cause of Disease.' (Forestry, Vol. 6, No. 2, 1932).

'The Ink Disease in England.' (Forestry, Vol. 6, No. 2, 1932).

FOGGIE, A. 'Some Notes on the Troodos Pine of Cyprus.' (Kew Bulletin, 1933).

HOYLE, A. C., and DUNKLEY, L. H. 'New Trees and Shrubs from Tropical Africa,' II. (Kew Bulletin, 1933).

MACDONALD, J. 'The Form of the Stem in Coniferous Trees.' Part 2. (Forestry, Vol. 6, No. 2, 1932).

'The Form of the Stem in Coniferous Trees.' Part 3. (Forestry, Vol. 7, No. 1, 1933).

'Experimental Methods in Silviculture.' Paper read at the International Conference of Forest Research Organisations, Nancy, September 1932.

PEACE, T. R. 'The Dutch Elm Disease.' (Forestry, Vol. 6, No. 2, 1932).

TROUP, R. S. 'Some Problems of British Forestry.' (British Science Guild, 1933).

APPENDIX II.

LIST OF BOTANICAL SPECIMENS RECEIVED.

The following is a list of herbarium and wood specimens received, for which special acknowledgments are due :—

1. HERBARIUM SPECIMENS.

EUROPE.

The British Isles: Various correspondents, 321; Forest Products Research Laboratory, Princes Risborough, 349; Dr. J. Burtt Davy, 560; Dr. L. Chalk, 1; Mr. W. R. Day and Mr. T. R. Peace, 27; Mr. J. Macdonald, 14; Mr. P. G. Beak, 65; Mr. G. S. Cansdale, 9; Mr. J. Shaw, 1; Mr. A. C. Hoyle and Mr. L. H. Dunkley, 144; Miss M. M. Chattaway, 1; Dr. R. N. Chrystal, 1; Mr. J. W. M. Williams, 8. *Germany:* Herr Strubenrauch, Forstverwalter zu Hordt, Amt Rulzheim, Rheinpfalz, 10 (*Populus charkowiensis*); Dr. A. Rehder, Arnold Arboretum, U.S.A., 21 specimens from Thuringia. *Bulgaria:* Dr. A. Rehder, 57.

ASIA.

British North Borneo: The Director, Royal Botanic Gardens, Kew, 23. *China:* Dr. A. Rehder, 353; Dr. W. R. Maxon, National Herbarium, Washington, D.C., U.S.A., 150. *Cyprus:* The Conservator of Forests, Nicosia, 2. *India:* The Forest Research Institute, Dehra Dun, 305. *Malaya:* The Director, Botanic Gardens, Singapore, 92.

AFRICA.

Belgian Congo: Professor Dr. W. Robyns, Director of the *Jardin Botanique de l'État,* Brussels, 147. *Gold Coast:* The Conservator of Forests, Accra, through Mr. C. Vigne, 554. *Kenya Colony:* The Conservator of Forests, Nairobi, 31; The Director, Royal Botanic Gardens, Kew, 125. *Nigeria:* The Director of Forests, Ibadan, 21; Mr. D. F. Chesters, 9; Mr. J. Dundas, 26; Mr. J. H. Mackay, 6; Mr. T. G. Wood, 1; The Director, Forest Products Research Laboratory, Princes Risborough, 4. *Nyasaland:* The Conservator of Forests, Zomba, 121. *Northern Rhodesia:* The Senior Assistant Conservator of Forests, Mazabuka, 357; Mr. J. D. Martin, 234; Mr. O. B. Miller, 18. *Southern Rhodesia:* The Conservator of Forests, Salisbury, 23; Mr. A. A. Pardy, 73; Mr. C. J. W. Pitt-Schenkel, 159; Miss Steedman, 18. *Sierra Leone:* The Conservator of Forests, Freetown, 71. *Tanganyika Territory:* The Conservator of Forests, Lushoto, 148; Mr. P. J. Greenway, Amani, 151; Mr. B. D. Burtt, Tsetse Research Department, 25; The Director, Royal Botanic Gardens, Kew, 50; The Director, Forest Products Research Laboratory, Princes Risborough, 16. *Uganda:* The Conservator of Forests, Entebbe, 70; Mr. W. J. Eggeling, 92; The Director, Royal

Botanic Gardens, Kew, 34. *Union of South Africa:* Mrs. A.B. Gillett, Oxford, 55. *West Africa:* Dr. A. Rehder, 43. *Zanzibar:* Professor R. S. Troup, 4.

AMERICA.

United States: Dr. A. Rehder, 183; Professor W. Metcalf, 9 specimens of Eucalyptus from California; Professor W. L. Jepson, 13. *British Honduras:* The Director, Forest Products Research Laboratory, Princes Risborough, 72. *West Indies:* The Director, Forest Products Research Laboratory, Princes Risborough, 27. *Argentina:* Professor L. Hauman, Brussels, 2. *Venezuela:* Mr. R. O. Williams, Trinidad, 24.

AUSTRALASIA.

Australia: The Commonwealth Forestry Bureau, Canberra, 52; The Government Botanist, Brisbane, 17; The Director, Botanic Gardens, Sydney, 41. *New Zealand:* Mr. G. de S. Baylis, Auckland, 1. *Solomon Islands:* Mr. R. A. Sykes, 30.

2. WOOD SPECIMENS.

Hand specimens for type collection:—

EUROPE: The Foundation of Forest Products Research, Helsingfors, 24; Forest Products Research Laboratory, Princes Risborough, 87; the Rev. Professor G. Henslow, 1; Mr. J. C. Maby, Oxford, 1.

ASIA: The Forest Research Institute, Selangor, F.M.S., 596; The Director, Royal Botanic Gardens, Singapore, 27; Professor M. Fujioka, Tokyo Imperial University, Japan, 18; Dr. L. J. Reyes, Philippine Islands, 2.

AFRICA: Mr. A. Lucas, Cairo, Egypt, 1; The Conservator of Forests, Gold Coast, through Mr. C. Vigne, 162; The Conservator of Forests, Kenya, 2; The Director of Forests, Nigeria, through Mr. J. D. Kennedy, 12; through Mr. D. F. Chesters, 2; through Mr. D. R. Rosevear, 1; Mr. Duncan Stevenson, Forest Department, N. Rhodesia, 31; through Mr. C. E. Duff, 2; Mr. E. J. Kelly Edwards, Forestry Division, S. Rhodesia, 4; The Forest Products Institute, Pretoria, 15; The Conservator of Forests, Tanganyika, through Mr. L. G. T. Wigg, 3; The Conservator of Forests, Uganda, through Mr. W. J. Eggeling, 16; The Conservator of Forests, Nyasaland, 1; from the Seychelles Islands, through Professor J. Stanley Gardiner, Cambridge, 22.

AMERICA: The Conservator of Forests, British Guiana, 1; Mr. C. L. Sidey, Ecuador, 18; The Conservator of Forests, Trinidad, 1; Professor S. J. Record, U.S.A., 179; Dr. J. H. Kugler, Venezuela, 13.

AUSTRALASIA: Mr. W. A. Robertson, Fiji, 14; Mr. R. A. Sykes, New Zealand, 12, Solomon Islands, 16.

PROSPECTUS.

Scope of Work. The Institute is intended to provide courses of advanced study; its work comprises (1) post-graduate training of probationers for the forest services and other qualified persons, (2) training of research officers in special subjects, and (3) provision of courses for selected officers already serving.

The Institute does not undertake to provide a general training in Forestry such as is given at Universities or other centres where this subject is taught.

Admission of Students. Only persons falling within one or other of the following categories are eligible for admission to the Institute:—

(*a*) Those possessing a Degree in Forestry or a Diploma or equivalent certificate of having satisfactorily completed an approved course of training in Forestry, who have been selected as probationers for the higher branch of some forest service;

(*b*) Graduates with honours in Science who desire to become specialists in some branch of work connected with Forestry;

(*c*) Forest officers deputed by their Governments to attend courses with the view of bringing their professional knowledge up to date;

(*d*) Students of approved qualifications not included in the first three categories who are admitted on the recommendation of Overseas Governments.

(*e*) Students with a University training in Forestry who may wish to attend the Institute on their own account and at their own expense.

Note.—No officer in any Public Service in the British Empire will be admitted to the Institute unless he is officially deputed by the Government under which he is serving; (2) the Board of Governors of the Institute reserve the right to refuse the admission of applicants other than nominees of contributing Departments and Governments.

Names of applicants for admission should be sent, together with details of previous training and subjects which it is proposed to study, to the Director, Imperial Forestry Institute, Oxford, at least three months before the date on which it is proposed to join: the Director cannot undertake to consider applications received at shorter notice.

Terms and Vacations. The academic year begins early in October, and is divided into the following Terms and Vacations :

Michaelmas Term (8 weeks, early October to early December).
Christmas Vacation (early December to middle of January).
Hilary Term (8 weeks, middle of January to middle of March).
Easter Vacation (middle of March to end of April).
Trinity Term (8 weeks, end of April to end of June).
Long Vacation (early July to early October).

Courses of Study. — The courses of study are normally of three kinds :—

(1) For post-graduate probationers who have not yet taken up their appointments : the course ordinarily extends over one academic year, beginning October, and including practical work in part of the Easter and Long Vacations.

(2) For forest officers on leave, or others who propose to attend the Institute with the view of spending some time (normally one year) in specializing in some particular branch of work ; the course of study will be adapted to individual needs, and will ordinarily begin in October.

(3) For forest officers on leave who propose to spend part of the year only on ' refresher ' courses. *These should attend during the spring and summer months, and not between October and January.* The distribution of work in the more usual subjects studied in ' refresher ' courses is as follows :—

Silvicultural Systems : Trinity Term, with Continental tours in Easter and Long Vacations (middle of March to middle of September).

Methods of artificial regeneration : Hilary and part of Trinity Terms and Easter Vacation (middle of January to end of May).

Forest Management, Regional Survey, Stocktaking and Working Plans : Easter Vacation, Trinity Term and Long Vacation (middle of March to middle of August).

Tropical Silviculture : Trinity Term (end of April to end of June).

Surveying : Trinity Term (end of April to end of June).

Forest Utilization and Engineering : (1) Special work in timber mechanics, and wood seasoning and preservation at the Forest Products Research Laboratory, Princes Risborough, can be arranged at any time throughout the year.

(2) *Road project:* Trinity Term (end of April to end of June).

Systematic Botany: (1) *Full course:* three Terms (middle of October to end of June).

(2) *Short Courses:* (*a*) two Terms—Hilary and Trinity (middle of January to end of June); or (*b*) one Term, Hilary or Trinity.

Continental Tours: Easter and Long Vacations.

Persons wishing to join Continental tours are reminded that their visits should coincide with the normal tours arranged in the Easter and Long Vacations (*i.e.* the middle of March to the end of April, and early July to early October). Neither the Institute nor any member of its Staff is authorized to arrange visits or to furnish introductions on behalf of persons desiring to visit Continental centres on their own account.

Subjects of a more special kind, such as Entomology, Mycology, Wood Structure, Methods of Ecological Survey, Soil Properties, etc., can be studied at times to be arranged to suit individual requirements, provided notice of not less than three months is given.

Fees. An inclusive fee of £75 will be charged for instruction for one whole year at the Institute. If the course of studies extends over less than one year, the fees charged will be £25 per Term and £1 per week for tours in the Vacations. These fees will include all charges for instruction both at Oxford and on tour, as well as for the use of apparatus, materials, library, etc.; they will not include living and travelling expenses. Reduced fees may be charged in individual cases, at the discretion of the Director, to students attending the Institute at their own expense who do not belong to any Public Service.

No fees will be charged to students deputed by Governments and Departments which contribute to the funds of the Institute.

Expenses. Living expenses at Oxford during Term are roughly estimated at from £3 10*s.* to £4 10*s.* a week. Expenses on the Continent vary considerably with locality and other factors.

Membership of the University. Students of the Institute may, at their own discretion and if possessed of the necessary qualifications, be matriculated as members of the University; particulars regarding admission, expenses, etc., are given in a pamplet entitled *General Information concerning Admission, Residence, etc.,* obtainable (post free 6½*d.*) at the Clarendon Press Depot, High Street, Oxford. Students becoming members of the University will be eligible for the Diploma in Forestry on fulfilling the conditions laid down by the University Statutes.

PUBLICATIONS ISSUED BY THE IMPERIAL FORESTRY INSTITUTE.

OXFORD FORESTRY MEMOIRS.*

1. The Relation between Height Growth of Trees and Meteorological Conditions. By W. E. Hiley and Norman Cunliffe. 1922. 3*s*. 6*d*.

2. Soil Acidity and its Relation to the Production of Nitrate and Ammonia in Woodland Soils. By G. R. Clarke. 1924. 3*s*. 6*d*.

3. The Watermark Disease of the Cricket-bat Willow (*Salix caerulea*). By W. R. Day. 1924. 3*s*. 6*d*.

4. Measurements of the Cubical Contents of Forest Crops. By M. D. Chaturvedi. 1926. 10*s*. 6*d*.

5. The Physiography of Southern Nigeria and its Effect on the Forest Flora of the Country. By J. R. Ainslie. 1926. 4*s*. 0*d*.

6. The Financial Return from the Cultivation of Scots and Corsican Pines. By W. E. Hiley. 3*s*. 6*d*.

7. The Gold Coast Forest: A Study in Synecology. By T. F. Chipp. 1927. 10*s*. 0*d*.

8. The Forest Industry of Finland. By W. E. Hiley. 1928. 4*s*. 6*d*.

9. Aerial Survey in Relation to the economic Development of new Countries, with special Reference to an Investigation carried out in Northern Rhodesia. By R. Bourne. 1928. 7*s*. 6*d*.

10. Formation of Spring and Summer Wood in Ash and Douglas Fir. By L. Chalk. 1930. 6*s*. 0*d*.

11. Studies of the Sirex Parasites. By R. N. Chrystal. 1930. 5*s*. 0*d*.

12. The Plasticity of the Root System of Corsican Pine in early Life: Researches designed to facilitate the Establishment of this Tree in Great Britain. By R. N. Aldrich-Blake. 1930. 6*s*. 0*d*.

13. Regional Survey and its Relation to Stocktaking of the Agricultural and Forest Resources of the British Empire. By R. Bourne. 1931. 15*s*. 0*d*.

14. The Fixation of atmospheric Nitrogen by Bacteria living symbiotically in Root Nodules of *Casuarina equisetifolia*. By R. N. Aldrich-Blake. 1932. 3*s*. 6*d*.

15. *Meria laricis*, the Leaf Cast Disease of Larch. By T. R. Peace and C. H. Holmes. 1933. 4*s*. (In the press).

16. The Experimental Production and the Diagnosis of Frost Injury on Forest Trees. By W. R. Day. 1933. (In the press).

OXFORD MANUALS OF FORESTRY.**

Silvicultural Systems. By R. S. Troup. 1928. 21*s*.

The Economics of Forestry. By W. E. Hiley. 1930. 21*s*.

FOREST TREES AND TIMBERS OF THE BRITISH EMPIRE.*

1. Some East African Coniferae and Leguminosae. By L. Chalk, J. Burtt Davy and H. E. Desch. 1931.

2. Twenty West African Timber Trees. By L. Chalk, J. Burtt Davy, H. E. Desch and A. C. Hoyle. 1933. 7*s*. 6*d*. (In the press).

MISCELLANEOUS.

Handbook of Conifers grown in the Arboretum, Bagley Wood, Oxford.* By J. Burtt Davy. 1926. 2*s*. 0*d*.

Collection and Preparation of Herbarium and Timber Specimens. By J. Burtt Davy and L. Chalk. 1928. 8*d*.

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* To be purchased from the Librarian, Imperial Forestry Institute, Oxford. Postage extra.

** To be purchased from the Clarendon Press, Oxford. Postage extra.